

EFFECTS OF PRINCIPAL LEADERSHIP STYLES ON
ICT USAGE AMONG MALAYSIAN SECONDARY
MATHEMATICS AND SCIENCE TEACHERS

VOON JAN CHAM

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ABSTRACT

With the increasing use of Information and Communication Technology (ICT) in education, principal leadership would correspondingly become important to ensure the success of ICT usage in school. The usage of ICT in education could improve students' motivation and achievement in learning, and principals have a crucial role to play in ensuring teachers could enhance the teaching and learning in classroom by integrating computer technology. This study examined the effects of Principal Leadership Styles on ICT Usage of mathematics and science teachers among secondary schools in Malaysia. The primary objective of the present study was to assess the relationships between Transformational and Transactional Leadership Styles of principals, Teacher Planned Behaviour and ICT Usage of the teachers in the teaching and learning of Mathematics and Science in classroom. This study employed a cross-sectional survey research design to answer the research objectives and used Structural Equation Modeling technique (SEM) to assess the model. A cluster random sampling technique was then used to obtain the samples from Malaysian secondary schools. A total of 524 valid responses out of 1800 were achieved, yielding a final response rate of 29.1%. The results concluded that aspects of Principal Leadership Styles exerted differing effects on Teachers' Planned Behaviour, which in turn, influenced aspects of ICT Usage of teachers in classroom. The result confirmed that Planned Behaviour of teachers acted as a mediating construct between Transformational Leadership Style and ICT Usage in classroom teaching. The result also confirmed that Planned Behaviour of teachers acted as a mediating construct between Transactional Leadership Style and ICT Usage in classroom teaching. However, the result indicated that Transformational Leadership Style did not have a significant direct relationship with Teachers' ICT Usage. Also, the result indicated that Transactional Leadership Style did not affect Teachers' ICT Usage significantly in the context of classroom teaching of Mathematics and Science. Furthermore, the result concluded that there was a significantly positive relationship between Teachers' Planned Behaviour and Teachers' ICT Usage. The best structural model has achieved adequate goodness of fit (Chisquare- 479, df- 180, GFI- .851, CFI- .902, RMR- .002)

Key Words:

Transformational and Transactional Leadership Styles, Teachers' Planned Behaviour, ICT Usage, Structural Equation Modeling

**KESAN-KESAN GAYA KEPEMIMPINAN PENGETUA
ATAS PENGGUNAAN TMK ANTARA GURU-GURU MATEMATIK DAN SAINS
DI SEKOLAH MENENGAH MALAYSIA**

VOON JAN CHAM

ABSTRAK

Dengan peningkatan dalam penggunaan Teknologi Maklumat dan Komunikasi (TMK) dalam bidang pendidikan, kepemimpinan pengetua turut menjadi penting dalam memastikan kejayaan penggunaan TMK di sekolah. Penggunaan TMK boleh meningkatkan motivasi dan pencapaian pelajar dalam pembelajaran, dan pengetua mempunyai peranan yang penting dalam memastikan guru dapat meningkatkan pengajaran dan pembelajaran dalam bilik darjah dengan mengintegrasikan teknologi computer. Kajian ini mengkaji kesan-kesan Gaya Kepemimpinan Pengetua ke atas Penggunaan TMK oleh guru-guru matematik dan sains di sekolah-sekolah menengah di Malaysia. Objektif utama kajian ini ialah untuk menilai hubungan antara Gaya Kepemimpinan Transformasi dan Gaya Kepemimpinan Transaksi Pengetua, Perancangan Tingkahlaku Guru dan Penggunaan TMK oleh guru dalam pengajaran dan pembelajaran Matematik and Sains di bilik darjah. Kajian ini menggunakan rekabentuk survei keratan rentas untuk menjawab objektif-objektif kajian serta menggunakan teknik Pemodelan Persamaan Berstruktur (PPB) untuk menilai model berkenaan. Teknik pensampelan rawak berkelompok telah digunakan untuk mendapat sampel yang terdiri daripada sekolah-sekolah menengah di Malaysia. Sejumlah 524 respon yang sah telah diperolehi daripada 1800 untuk menghasilkan kadar respon terakhir sebanyak 29.1 peratus. Keputusan-keputusan merumuskan aspek-aspek Gaya Kepemimpinan Pengetua memberi kesan yang berbeza-beza ke atas Perancangan Tingkahlaku Guru dan seterusnya mempengaruhi Penggunaan TMK guru-guru di bilik darjah. Keputusan telah mengesahkan Perancangan Tingkahlaku Guru menjadi konstruk pengantara antara Gaya Kepemimpinan Transformasi dan Penggunaan TMK dalam pengajaran di bilik darjah. Keputusan juga telah mengesahkan Perancangan Tingkahlaku Guru menjadi konstruk pengantara antara Gaya Kepemimpinan Transaksi dan Penggunaan TMK dalam pengajaran di bilik darjah. Walau bagaimanapun, keputusan menunjukkan Gaya Kepemimpinan Transformasi tidak mempunyai hubungan langsung yang signifikan dengan Penggunaan TMK Guru. Juga, Gaya Kepemimpinan Transaksi tidak mempunyai hubungan langsung yang signifikan dengan Penggunaan TMK Guru dalam konteks pengajaran Matematik dan Sains di bilik darjah. Tambahan lagi, keputusan merumuskan terdapatnya hubungan positif yang signifikan antara Perancangan Tingkahlaku Guru dan Penggunaan TMK Guru. Model berstruktur terbaik telah mencapai tahap kesepadanan yang mencukupi (Chisquare- 479, df- 180, GFI- .851, CFI- .902, RMR- .002)

Kata Kunci:

Gaya Kepemimpinan Transformasi dan Transaksi Pengetua, Perancangan Tingkahlaku Guru, Penggunaan Teknologi Maklumat dan Komunikasi, Pemodelan Persamaan Berstruktur

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter provides an overview of the research. It describes the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, limitations, and definition of various research terms. Technology has become part and parcel of today's school system. Lakhani and Lars (2007) commented that the challenge of using technology effectively in schools required teachers to develop innovative and creative ways and research indicated that such innovations occur best at the intersection of disciplines (Kozloski, 2006; Lakhani & Lars, 2007). Friedman (2005), for example, noted the critical role of education in today's knowledge economy and as human pushed the frontiers of knowledge, work at every level becomes more complex, requiring more pattern recognition and problem solving. And the most important attribute one could have was creative imagination - the ability to be first to figure out how these technological tools could be put together in new exciting ways to create products, communities, opportunities, and profits.

1.1 Information and Communication Technology in Education

According to Bennett (1999), the use of Information and Communication Technology (ICT) in education improved student motivation and achievement, and teachers were able to transform the

classroom by utilizing computer technology. Oster (2005), for example, investigated the impact of introducing computer-assisted learning on science problem-solving skills of seventh grade pupils in a high school in a small Israel town. Neither the pupils, nor their teachers, had experienced computer-assisted learning previously. Oster's findings suggested that the classroom climate, assisted by computers as data resources, provides cognitive support for the pupils in independent and peer-groups learning.

In terms of classroom ICT use, since the last decade, the literature documented increased usage of ICT in schools (Aguaded, Fandos, & Pérez 2009). These have led to a need to investigate the extent of teachers' use of ICT in teaching and learning. According to Aguaded, Fandos, and Pérez (2009), teachers had made great efforts, but due to the lack of incentives, encouragement and support by the school administration, there was a risk of decreasing teachers' involvement in using technology in classroom. Past studies by Aguaded et al. (2009), Backhouse (2003), Becker (2001), Charp (2000), Cuban (2000, 2001), Cuban, Kirkpatrick and Peck (2001), Emery (2002), Rothkopf (2009), and Teo, Chwee, Ching, and Su (2009) reported that many teachers did not fully utilize ICT as a teaching and learning tool in their classrooms despite more and more ICT equipment being made available in classrooms. Studies continued to show high resistance to ICT use by teachers in most of the schools (Schiller, 2000, 2002, 2003; Paul, Theodore, & Will, 2003). Wolski and Jackson (1999) found that some teachers resisted ICT entirely, and even among teachers who embraced change, many might not be using ICT as a teaching and learning tool to its fullest potential. Albion (1996) reported that although many teachers believed in the use of ICT and had the necessary technical skills to employ them in teaching, they might be reluctant to implement them in their classrooms. Various reasons were suggested to explain teachers'

reluctance to use ICT in their teaching. Among other reasons reported were lack of teacher training, lack of appropriate software, negative ICT attitudes, and different psychological reasons (Bennett, 1999).

Studies showed that there were supportive or administrative use of ICT in school rather than the use of ICT in classroom for teaching and learning. Cuban (1999, 2000) used a combination of case studies, classroom observations, and on-site surveys to investigate how computers were used in the Silicon Valley K-12 schools. Cuban (2001) demonstrated that teachers mostly used computers to prepare for classes rather than for direct instructions. Teachers used computers to sustain current classroom practices, and also for managing and communication purposes. Cuban (2001) reported that little classroom instruction was conducted using ICT, a trend that did not serve the objective of teaching and learning. Cuban (2001) in his study pointed out that in the United States of America, teachers moved from non-use to occasional use and finally to serious use, that is from at least once a month to at least one or more times in a week respectively. Matthews (2000) reported that in 55 rural schools in the state of Idaho, United States, 30 percent to 50 percent of the teachers never used ICT for teaching, over 70 percent of teachers never used Internet in the classrooms, while more than 50 percent of the teachers rated themselves as novice ICT users.

In Scotland, Conlon and Simpson (2003) compared data from a major Scottish study with research from the United States of America and concluded that the results were similar. Research studies from both countries showed that teachers mostly had access to ICT for instructive purposes but they rarely used them. They also reported that most teachers used ICT for supportive

purposes. For example, ICT was used for word processing, writing reports, and other administrative purposes. Another research study conducted by Williams, Coles, Wilson, Richardson, and Tuson (2000), which involved teachers from both secondary and primary schools in Scotland also reported low use of ICT by teachers in terms of classroom instruction. They also reported that most of the teachers had Internet access but unfortunately they seldom used it in their classrooms.

In terms of subjects taught using ICT in school, Williams et al. (2000) reported that there was a clear pattern of low and high use of ICT among the secondary school teachers where mathematics teachers were low users and teachers in business and management subjects were high users of ICT. This study also showed that there was a difference in the level of ICT usage in classroom instruction for different subjects such as between science and arts subject.

Gningue (2003) reported a study involving Middle and High schools where two groups of mathematics teachers were trained to use selected computer technologies through two professional development experiences: one long term, the other short term. There were changes in teacher attitudes and beliefs due to technology training. The positive outcome might be explained by the length and extent to which the concepts were studied among the participants. At the end, most participants wrote in their reflections that their pre-training beliefs and attitudes were the consequence of their lack of opportunity to experience the use of technology, in a way similar to what they did in the course, and of their lack of confidence in their ability to design activities to enhance the mathematics curriculum (Gningue, 2003).

Pedagogical or instructional use of ICT in classroom remains an important issue for the teachers and educators to resolve (Rothkopf, 2009). Huffman, Goldberg, and Michlin (2003) explored the use of computers to create constructivist learning environments and found the use of computers could significantly alter both teaching methods and students' achievement. In their study, data from 23 high school physics classes and 13 teachers were examined to determine the extent to which computers could alter pedagogy and student achievement. Three groups of teachers were examined: experienced users of the new pedagogy and materials, beginning users of the new pedagogy and materials, and a group of comparison teachers who used traditional instructional methods.

The results from the study showed that the materials helped teachers in creating learning environments. The survey results indicated that the experienced teachers used the most constructivist techniques while the beginning teachers used slightly fewer constructivist techniques. In terms of students' achievements, the result showed that the project significantly improved students' understanding of physics concepts. When compared with the traditional classes, students in the project classes had made significant higher gains in their understanding of physics concepts. The study also pointed out two major caveats: the limitation of computer technology in the schools such as teachers who used it for the first time faced many technical challenges, and second, teachers needed more professional development and support to implement the computer-assisted programme (Huffman et al. 2003).

Andrew, Ford, David, and Philippa (2005) explored the issue of the use of Internet in classroom amongst secondary school teachers in Sheffield, United Kingdom. A questionnaire was generated

from the results of a series of interviews at the City School, one of the 27 state secondary schools in Sheffield. Nearly 85 percent of teachers acquired their Internet skills informally (self-taught, learned from friend/colleagues, etc.), rather than through taught courses. Despite this, most of the respondents were confident of their ability to use the Internet, with the most confident users being young teachers of technical subjects.

However, there was a predominant perception (particularly among women teachers) that students were more competent users of the Internet than teachers. Older teachers were more likely to feel pressured to use the Internet than their younger colleagues and only about a third of the teachers agreed that they often used Internet in classes. Responses in the study varied significantly according to school and subject taught. There was strong support for the suggestion that the Internet was a valuable source of learning and to obtain teaching materials.

Andrew et al. (2005) suggested that the rapid rise of ICT (particularly the Internet use) within the classroom, together with some perceived pressure to use it, led to a superficial grafting of the technologies into existing practice. Evans-Andris (1995) found that even though teachers had the authority over the decisions of ICT usage in teaching, this did not always lead to actual increase in ICT use. This study also found that majority (60 percent) of teachers avoided the meaningful use of ICT in teaching. Only 30 percent of teachers were active ICT users and had developed an integrative style of teaching with ICT.

Recent study continued to stress the importance of ICT use in classroom, as evidenced by a major policy paper of Columbia University. Rothkopf (2009) reiterated a major American initiative,

marshaling the resources of the national educational system to standardize and to “technologize” school instruction in the critical disciplines, most notably mathematics and science. Rothkopf (2009) proposed a massive infusion of technology to support this initiative, backed by the full force of federal and state governments and the private sector.

It would appear that teachers’ use of ICT especially in classroom instruction has yet to reach a satisfactory level. ICT was under use in teaching and learning; and there were problems related to pedagogy, technical and attitudinal differences between young and older teachers, and between science and arts teachers. Teachers also used ICT either for supportive purposes or instruction in class in varying degrees due to various reasons under different school situations. Again, such low use of ICT in classroom required an investigation into the possible reasons in order to improve and optimise the usage of ICT in classroom for the benefit of the students. Thus, it is important to investigate the perceptions of teachers in the context of using ICT to teach Mathematics and Science.

1.1.1 School ICT Leadership

Past studies found that principals could make a substantial impact on teachers’ utilization of technology in their classrooms (Emery, 2002; Gerard, Bowyer, & Linn, 2008; Gokce, 2009; Jacobsen & Hunter, 2003; Kincaid & Feldner, 2002; Schiller, 2002). Studies on the barriers of ICT uptake by teachers also reported a lack of school leaders’ knowledge about advanced technologies. Garrett (2003) found that principals needed to learn about the different uses of technology in education and made decisions on how to plan, implement, manage and lead in their

schools. He also pointed out that principals need to know how technology could improve students' achievement, how to make data driven decisions, how much technology staff and technological support are required to carry out technology-based policies. Yee (2000) stressed that leaders such as school principals need to communicate and share a clear ICT vision with the school communities. Also, according to Emery (2002), Jacobsen and Hunter (2003), Kincaid and Feldner (2002), and Schiller (2002), principals should be standing at the vanguard position in any school technology integration initiatives. Similarly, this study would examine the vital roles played by school principals to ensure ICT in schools benefit the teachers and students alike.

Gokce (2009) reported the importance of leadership in ICT use in schools, suggesting school principal played a key role. Crow (2006) found that new principals needed to learn in terms of ICT leadership in schools. Crow's opinion about the role of the principal was supported by Thomson, Nixon, and Comber (2006), who wrote about ICT implementation in an Australian context. In another recent study, Gerard et al. (2008) found that reforms such as technology-enhanced instruction required principal leadership. Yet, many principals reported that they needed help to guide implementation of science and technology reforms. Thus, Gerard et al. (2008) identified strategies for helping principals provided this leadership. Principals sought to improve their own knowledge to support this reform and principals organized their ideas around individual school goals and current political issues. Gerald et al. (2008) also found principals preferred professional development activities that engaged them in reviewing curricula and student work with other principals in terms of ICT leadership in school. Such studies showed the importance of principal ICT leadership which was needed to ensure the success of ICT usage among teachers and students in schools.

Thus, from the past studies, school leadership especially the principals were playing a major role in ensuring the success of the implementation of ICT in teaching and learning in classroom. This study would examine teachers' perceptions toward the different principal leadership styles in terms of teaching and learning of Mathematics and Science in the Malaysian context.

1.2 ICT Education in Malaysia

Ho (2005) examined the relationship of Perceived Principal's Behaviour and Health of suburban Secondary schools in Kuching, Malaysia. He concluded that the leadership behaviour of principal had influenced school climate and school effectiveness. Principal's open attitudes created an environment that was supportive, encouraged teacher autonomy, freed teachers from routine busy work so that they could concentrate on teaching. Moreover, the principal was open and approachable to teachers and genuinely concerned with both their social needs as well as task achievement of the school.

Ho's (2005) study implied that the principal should lead by example. The principal should not ask teachers to do anything that he or she would not do. In that way, the principal would likely find voluntary compliance and cooperation among teachers. Ho (2005) also stressed that a rigid, domineering principal behaviour rarely produced commitment, to the contrary, in an atmosphere of close monitoring and suspicion, teachers would likely become alienated, uncooperative, and turn against each other, and the principal. Moreover, Ho said that leadership that was supportive encouraged teacher initiation, and freeing teacher from administrative trivia was instrumental in

forging an open organizational climate. Open relations between teachers and principals were necessary if schools were to become truly professional organizations. Ho's (2005) survey involving 286 teachers from four secondary schools, using Principal Behaviours and Teachers Behaviours as independent variables, and School Climate and School Effectiveness as dependent variables, although did not study specifically ICT leadership in school, certainly helped to understand the importance of principal leadership in a school setting which in turn would affect the performance of teachers in the classroom (Ho, 2005).

In another local study, Samuel and Zaitun (2006) conducted a study on the ICT use among the secondary school English teachers in Peninsula Malaysia and found that beside other factors, lack of support and no supervision on ICT integration by the principals were two obstacles found to be impeding the ICT integration in schools. Sixty-five percent of the respondents interviewed revealed some negative experiences in relation to receiving support from the principal related to using ICT in teaching.

Since the early 1990's the use of ICT in education were given increasingly high priority in Malaysian schools (Chan, 2004; Malaysian Smart School Implementation Plan, 1997). Three central policies for ICT in education were formulated. First, ensuring ICT equality for all students, second, emphasizing the role and function of ICT in education as a teaching and learning tool and third focusing on the use of ICT to increase productivity, efficiency and effectiveness of the school management system.

Schools are now heading into the era of ICT. The need to integrate ICT in teaching and learning at all school levels is becoming more and more demanding. Educators are expecting ICT to change the present education scenario and the way teachers teach and the way students learn. People are excited about how ICT would become a common part of the classroom as textbooks, blackboards, chairs and desks. Society is expecting teachers and students to use ICT in their classrooms as the way people use textbooks previously. The Ministry of Education (MOE) rigorously encourages schools to move forward and integrate ICT in teaching and learning (CEO Forum on Education and Technology, 2000, 2001; Michael, 1998).

According to Chan (2004), the main focus of ICT in education for years to come would be on the development of ICT infrastructure; enhancing ICT access and overcoming equity issues; increasing ICT-based curriculum; improving assessment system using ICT; stressing on the use of ICT in teaching and learning; upgrading the ICT knowledge and skills among students, teachers and education administrators; promoting the ICT use in educational management; upgrading efforts in the use of ICT for school management and maintenance of ICT tools; increasing research and development activities in the field of ICT; and enhancing the co-operation between education institutions and the community in promoting ICT use in education.

Some ICT projects in education implemented were the Computers in Education Project, the Malaysia Smart School Project, providing Mathematics, Science, and English teachers with laptop computers for teaching and learning purposes, the SchoolNet project, the school computerization programme, the Electronic Book project, the Universal Service Provision project,

and the Penang E-Learning Community project (Chan, 2004). There were also initiatives conducted by non-governmental agencies such as the Chinese Smart Schools and the Private Smart Schools project (Chan, 2004). Existing schools were also in the process of transforming themselves into Smart Schools and according to the Malaysian Smart School Implementation Plan (1997), all Malaysian schools would be Smart Schools by 2010.

In 2002, the government of Malaysia introduced a new approach on the use of ICT as teaching and learning tools in the teaching of Mathematics, Science, and English (*Berita Harian*, July 20, 2002). Under this policy, all Mathematics, Science, and English teachers were provided with laptop computers and teaching courseware (Chan, 2004). The core objective of these ICT-related endeavours was to ensure the ICT integration success in schools and finally improved students learning outcomes. The schools were equipped with ICT equipments such as LCD projectors, screens, and trolleys with speakers. The Ministry of Education (Smart School Bulletin, August 2005) reported that up to the year 2005, 4,500 schools were equipped with computer laboratories, 99,000 computer units and 4,600 servers. A total of 8,120 schools were connected to the broadband SchoolNet. A total amount of 97,000 laptop computers and 70,000 LCD projectors have been supplied to teachers who taught subjects such as Mathematics, Science and English.

The Malaysian Smart School Implementation Plan (1997) stated that the critical success factor for the implementation of the Smart schools was the human factor. The responsibility to convert the present ordinary schools into Smart or ICT-enriched schools fell on the shoulders of school principals as ICT leaders and classroom teachers as the front line implementers. School principals

and teachers were being called upon to shoulder more demanding roles and responsibilities in the area of integrating technology into classrooms (The Malaysian Smart School Implementation Plan, 1997). By 2003, four waves of the Smart School implementation plan were outlined. These were (1) Wave 1 - The pilot implementation on 87 schools (1999-2002), (2) Wave 2 - The post-pilot lessons learnt from the pilot (2002-2005), (3) Wave 3 - Making all schools smart (2005-2010), and (4) Wave 4 - Consolidate and stabilize technology to become an integral part of the nation's learning process (2010-2020). By February 13, 2003, the Flagship Coordination Committee met and agreed to take note of the completion of the Smart School Pilot Project, to affirm the Smart School concept as the basis for all technology initiatives in education, to agree to the roll-out of the Smart School, and to agree that the Ministry of Education's Smart School Steering Committee should develop and recommend an optimal roll-out model with a phased implementation approach to the MSC Malaysia Implementation Council chaired by the Prime Minister and the Cabinet.

Malaysian government also regarded the need to integrate ICT into teaching and learning as a high priority (The Malaysian Smart School Implementation Plan, 1997). The Malaysian Ministry of Education conducted training that included pre-service and in-service training for teachers as well as school administrators to foster the use of ICT in the classrooms. Nevertheless, according to Unesco (UNESCO Meta-survey on the Use of Technologies in Education in Asia Pacific 2003-2004, 2005), only a small number of teachers in Malaysia were able to integrate ICT into their teaching and few had the expertise to build courseware. Therefore, the number of teachers who incorporated ICT in their lessons to develop meaningful and effective teaching and learning were found to be low.

In Malaysia, ICT integration in teaching and learning is one of the top priorities in recent time. There was a wealth of materials in the form of CD-ROMs available to teachers. Hundreds of CD-ROMs were distributed to schools throughout the country. Many of the CD-ROMs had interactive lessons but according to findings from Samuel and Zaitun (2006) only 30 percent of the respondents acknowledged that they used these resources once in a while. Another 70 percent of the respondents kept these CD-ROMs, giving the reason of inadequate time to use them. Results from this study also found that teachers were aware of the benefits and knew how to integrate ICT tools in teaching and learning activities but unfortunately they were unable to carry out ICT integrated lessons in class.

A consultative paper on the expansion of smart school initiative to all Malaysia school (The Smart School, 2005) stated that consolidating and stabilizing technology was to become an integral part of the nation's learning process. Up till early 2003 the Smart School concept was still a work in progress and remained open to evolutionary refinement, including advances in pedagogy and improvements in information technology.

With regard to courseware, it was reported that most learning courseware in other countries was private-sector-owned and developed for a generic market. In contrast, the Smart School teaching-learning course was tailored-made for the Malaysian curriculum. Malaysia had in fact developed a comprehensive set of courseware comprising 1,494 titles covering Malay language, English, Science and Mathematics.

By 2005, there had been several enhancement efforts by various parties to expand the role of ICT in Malaysian schools. There were mainly the ICT-enabled teaching of Science and Mathematics in English, the government school computerization project aimed at equipping all schools with personal computers, a computer laboratory and the Schoolnet project which provides connectivity to all schools. It was reported that the Smart School Roadmap would eventually lead to the realization of an advanced Smart School scenario by 2020. Thus, this study remains relevant and able to provide information for the government to improve the Smart School concept in Malaysia.

In a recent survey, Teo et al. (2009) reported the pre-service teachers' self-reported future intentions to use technology in Singapore and Malaysia. Teo et al. (2009) used the Technology Acceptance Model (TAM) as a research framework, and 495 teachers from Singapore and Malaysia responded to an eleven-item questionnaire containing four constructs namely intention to use, attitude towards computer use, perceived usefulness, and perceived ease of use, which were important in the ICT use in classroom. Teo et al. (2009) concluded that Teacher training institutions should design and develop more relevant professional development courses for teachers and consider providing pre-service teachers with tools and experiences. There was a need to cultivate positive attitudes toward computer use which in turn reinforces their intention to use technology

Current study aimed at filling in the gap by examining the effects of perceived principal leadership styles on the teachers' ICT usage in the classrooms. The government of Malaysia was

serious about the success of ICT usage in schools to enhance teaching and learning as evidenced in the various programs especially the smart school concept which is an ongoing national work.

1.3 Statement of the Problem

ICT is becoming more and more common in schools and ICT use was found to be effective in improving student motivation and achievement (Bennett, 1999; Dwyer, 1996). Studies also indicated that it was a powerful tool for teaching and learning purposes (CEO Forum on Education & Technology, 2000, 2001; Christman, Lucking, & Badgett, 1997; Drucker, 1997;; Girod & Cavanaugh, 2001; Jonassen, 2000; Mandinach & Cline, 1996; Michael, 1998). Many researchers, policy makers and educators have researched into ICT usage in schools.

However, not many studies had looked at the principals' ICT leadership role in connecting ICT and teachers' ICT use in teaching and learning. According to Gibson (2002), the most important issue in the success of school technology integration was not only the preparation of teachers for technology use, but the effectiveness of principals' leadership. Williams et al. (2000) reported that if classroom technology integration was to be successful, leaders and teachers in a school should possess similar beliefs about the availability and nature of the school-based support, resources, professional development, vision, and incentives necessary to encourage change within a school environment. Williams et al. (2000), however, stated that teachers' wrong beliefs had been identified as a problem to classroom technology integration. Thus, it is important to study the effects of principal leadership on ICT usage in classroom (Benson, Peltier, & Matranga, 1999; Gokce, 1999; Wang, 2010).

The crucial role principals play as ICT leaders in schools was highlighted in past studies by Anderson and Dexter (2000, 2005), Brooks-Young (2000), Byrom and Bingham (2001), Casey (1993), Cavanaugh (2001), Chambers (2002), Gokce, (2009), Gurr (2000, 2004), Martin, Gersick, Nudell, and Culp (2002), McLester (2001), National School Boards Foundation (2002), Schoney (2002); Teo et al. (2009); the Malaysian Smart School Implementation Plan (1997), Thomas and Bainbridge (2000), and Yee (2000). In a recent study, Wang (2010) stated that a lack of principal leadership impeded the process of technology-integration in school and the school principals did not have a vision of technology integration for school education. Wang (2010) also stated that the principals did not take up the responsibility for managing resources for technology implementation. Principals could make a substantial change in teachers' use of ICT in teaching and learning (Emery, 2002; Jacobsen & Hunter, 2003; Kincaid & Feldner, 2002; Schiller, 2002).

The connection between principal leadership and the effectiveness of ICT implementation in schools was explored by some researchers (Anderson & Dexter, 2005; Brooks-Young, 2000; Byrom & Bingham, 2001; Cavanaugh, 2001; Chambers, 2002; Gurr, 2000, 2004; McLester, 2001, 2004; National School Boards Foundation, 2002; Schoney, 2002; Teo et al., 2009). They generally agreed that strong leadership was an important factor of successful technology integration. As school heads, principals had the overall accountability for ICT integration success (Casey, 1993). In a study conducted by Thomas and Bainbridge (2000), it was found that this overall responsibility was one of the most critical factors that determined the success of ICT integration in schools.

Leadership in schools emerged as a key factor in determining the success of information technology integration of ICT in schools. As a result, the role of principals evolved from that of managerial (Sharp & Walter, 1994), to instructional and curriculum leader (Checkley, 2002) as well as, to the new role of ICT leadership (Anderson & Dexter, 2005; Brooks-Young, 1997; Chang, 2002; Ford, 2000; Inksker, 1998, Kadela, 2002; Matthews, 2002; Maurer & Davidson, 1998; Scanga, 2004; Scott, 2005; Yee, 2000). Gibson (2002) reviewed the related literature and reported that the principals' role as ICT leaders was now becoming more and more seriously needed. This phenomenon showed that ICT leadership had become one of the elements in principals' leadership responsibility. Slowinski (2000) concurred with Gibson's (2002) findings when he stated that as the issue of ICT integration shifted from mere ICT and Internet access to the more fundamental issue of how to effectively utilize ICT in the classrooms, attention should be given to the study of what role the principals should play as ICT leaders.

It is important to recognise principal leadership for the successful integration of technology in school and in classroom instructions in particular. It is clear that the role of principals as ICT leaders is increasingly essential to make ICT innovation a success. School principals were assigned responsibility to take an active lead in the types of educational technology to be bought and how it would be used. School principals needed to be more actively involved in leading the ICT initiatives in schools (Benson et al., 1999).

The literature review showed some evidence indicating that principal leadership is one of the most vital elements in school effectiveness (Gokce, 2009; Hallinger & Heck, 1996) as a whole and specifically with regard to ICT implementation (Charp, 2000; Emery, 2002; Maurer &

Davidson, 1998; Mehlinger, 1996). But, at the same time the literature also reported a gap between the influence of principal leadership styles and the teachers' usage of ICT in classroom instruction. This study aimed to fill that gap by developing and validating a Structural Equation Model to predict and explain the direct influence of principal leadership styles on teachers' usage of ICT in classroom instruction as well as the indirect influence or mediated effect of principal leadership styles on ICT usage in classroom instruction by the planned behaviour of teachers.

If principal leadership is an important factor in schools' ICT integration, then it becomes necessary to investigate the influence of principal leadership styles on the teachers' behaviours on teaching with ICT and teachers' ICT usage in their classrooms. This study would utilize transformational leadership as well as transactional leadership that offered research-supported dimensions which in turn supported systemic change in organizations (Witmer, 2005). It was also important to understand the relationship between principal leadership styles and teachers' planned behaviour in order to better predict teachers' ICT usage in classroom instruction. This study drew on a theoretical approach to test a model proposing that principal leadership styles influenced teachers' usage of ICT in classroom instruction both directly and/or indirectly through the mediator namely Teachers' Planned Behaviour. It would highlight and interpret the relationships among Principal Leadership Styles, Teachers' Planned Behavior and teachers' ICT Usage in classroom instruction.

1.4 Research Framework

In this study, it was hypothesised that the principal leadership styles caused certain behaviours of teachers which determined the outcome of ICT usage in classroom instruction. The history of the process-product paradigm could be traced back at least 50 years ago but only became popular during 1970's. Analyses of process-product relationships lent themselves to pattern matching logic and path analysis. The amount of these cause-and-effect relationship studies had come to a new height with the introduction of the sophisticated statistical modelling packages such as LISREL and AMOS (Hair, Black, Babin, Anderson, & Tatham, 2006). This study would determine the causal relationships between principal leadership styles and teachers' ICT Usage in classroom as well as the mediating effect of teacher planned behaviour which are influenced by the principal leadership styles and in turn affect the teachers' ICT usage in classroom.

1.4.1 Integrating Theory of Transformational and Transactional Leadership Styles with Theory of Planned Behaviour (TPB)

In order to study the causal relationship of the Transformational and Transactional Leadership Styles and the Teachers' Planned Behaviour in ICT Usage, a hypothesised model was designed showing the measurement model as well as the structural model (see Figure 1.1). The direct and indirect effects of the independent variable on the dependent variables would be examined. The hypothesis was that the independent latent variables effected on dependent latent variable namely teachers' ICT usage in classroom instruction directly or/and indirectly through mediator latent variable namely Teachers' Planned Behaviour. This study would employ Exploratory Factor

Analysis (EFA) based on the pilot study questionnaires to determine which dimensions and variables were valid in the Malaysian context.

This study looked at the five relationships as conceptualised in the Principal Leadership Styles-Teachers' Planned Behaviour-Teachers' ICT Usage model (PLS-TPB-ICTU Model) as shown in Figure 1.1. The result of EFA might require a redefinition of Transformational and Transactional Leadership Styles based on the new set of valid variables used in the main study.

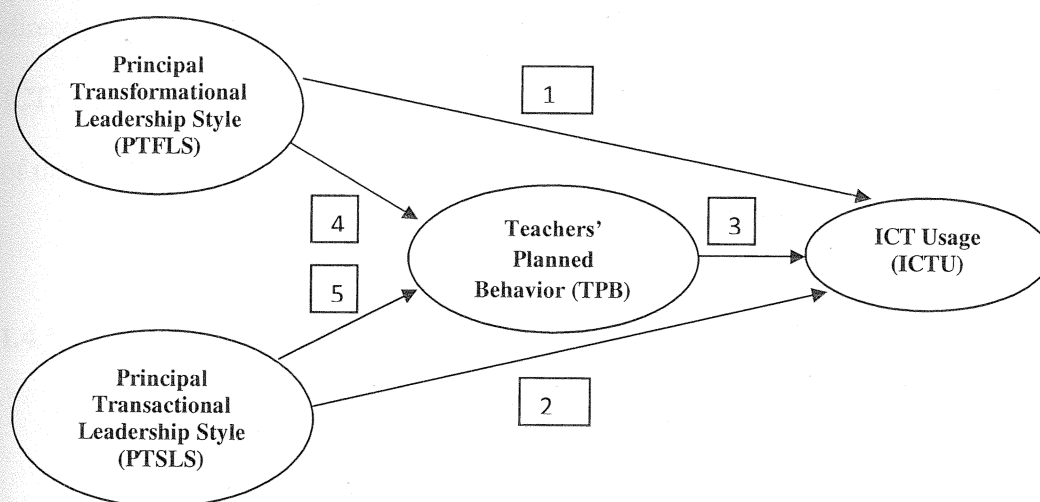


Figure 1.1. Principal Leadership Styles-Teachers' Planned Behaviour-Teachers' ICT Usage model (PLS-TPB-ICTU Model)

The first path showed the relationship and the direct effect of the independent variable namely Principal Transformational Leadership Style on the dependent variable ICT Usage in classroom instruction. It showed that perceived principal transformational leadership style directly influences ICT Usage for teachers in classroom instruction. The second path showed the

relationship and the direct effect between Principal Transactional Leadership Style and ICT Usage in classroom instruction. The third path showed the influence of Teachers' Planned Behaviour on ICT Usage in classroom instruction. The fourth path showed the relationship and indirect effect of the Transformational Leadership Style and the ICT Usage of teachers in classroom instruction mediated by the Teachers' Planned Behaviour. Similarly the fifth path showed the indirect effect of the Transactional Leadership Style on the ICT usage of teachers mediated the Teachers' Planned Behavior. The five paths in this model explained the total effect (direct and indirect effects) and influence of both Principal Leadership Styles on teachers' usage of ICT in classroom directly and/or indirectly through Teachers' Planned Behaviour with respect to teaching using ICT. This study attempted to confirm these relationships through the development and validation of the SEM model shown in Figure 1.1 to explain the interplays among the constructs studied.

1.4.1.1 First Latent Variable: Principal Transformational Leadership Style (PTFLS)

In this study, Transformational Leadership was defined as a form of leadership that united people to pursue a higher cause, resulting in significant change that represented the interests of both leaders and followers (Burns, 1978). A form that included factors like Idealised Influence (attribute), Idealised Influence (behaviour), Inspirational Motivation, Intellectual Stimulation, Individual consideration, and Contingent Reward (Bass & Avolio, 1994). Bass and Avolio's definition of Transformational Leadership differed from the definition presented by Burns (1978) who regarded Contingent Reward only as a component of Transactional Leadership.

1.4.1.4 Fourth Latent Variable: ICT Usage (ICTU)

In this study, the fourth or the outcome latent variable ICT Usage referred to teacher's use of ICT as a tool to prepare lessons, support classroom presentation using teaching courseware, and using Internet facilities to support instructions measuring in terms of ICT Use Intention, Overall Satisfaction, and Perceived Usefulness in classroom instruction.

There were three observed variables used to measure ICT usage. First, Overall Satisfaction (OS) which was the net feeling of pleasure or displeasure that users experienced based upon their individual expectations of the expected benefits of the ICT usefulness in this study (modified from Seddon & Kiew, 1996). Second, ICT Use Intention (IUI) which was a factor that would measure the outcomes in terms of lessons, presentation, student's understanding and learning skills (modified from Sallimah, 2005). The third factor, Perceived Usefulness (PU) referred to the perceptions of the users regarding tasks and job performance, productivity, time and money saving in the area of ICT usage in classroom instruction (modified from Armstrong, 2003).

1.5 Objectives of the Study

1.5.1 General Objective

The general objective of this study was to determine the effects of principal leadership styles on the teachers' ICT usage amongst mathematics and science teachers in Malaysian secondary schools.

1.5.2 Specific Objectives

Specifically, the objectives of the study were to

1. determine the extent Transformational Leadership Style influenced mathematics and science teachers in terms ICT Usage in classroom instruction.
2. determine the extent Transactional Leadership Style influenced mathematics and science teachers in terms of ICT Usage in classroom instruction.
3. determine the extent Teachers' Planned Behaviour influenced ICT Usage in classroom instruction.
4. determine the extent Transformational Leadership Style influenced ICT Usage in classroom instruction mediated by Teachers' Planned Behaviour.

5. determine the extent Transactional Leadership Style influenced ICT Usage in classroom instruction mediated by Teachers' Planned Behaviour.

1.6 Research Questions and Hypotheses

The following research questions were formulated for this study:

1. Is there a direct causal relationship between Principal Transformational Leadership Style and Teachers' Usage of ICT in the teaching of Mathematics and Science?
2. Is there a direct causal relationship between Principal Transactional Leadership Style and Teachers' Usage of ICT in the teaching of Mathematics and Science?
3. Is there a direct causal relationship between Teachers' Planned Behaviour and Teachers' Usage of ICT in the teaching of Mathematics and Science?
4. Is there a causal relationship between Principal Transformational Leadership Style and Teachers' Usage of ICT in the teaching of Mathematics and Science, mediated by Teachers' Planned Behaviour?
5. Is there a causal relationship between Principal Transformational Leadership Style and Teachers' Usage of ICT in the teaching of Mathematics and Science mediated by Teachers' Planned Behaviour?

The following null hypotheses were proposed for the conceptual model involving the five pathways:

- H1 There is no significant relationship between Principal Transformational Leadership Style and Teacher's ICT Usage.
- H2 There is no significant relationship between Principal Transactional Leadership Style and Teacher's ICT Usage.
- H3 There is no significant relationship between Teacher's Planned Behaviour and Teacher's ICT Usage.
- H4 There is no significant relationship between Transformational Leadership Style and Teacher's ICT Usage, mediated by Teacher's Planned Behaviour.
- H5 There is no significant relationship between Principal Transactional Leadership Style and Teacher's ICT Usage, mediated by Teacher's Planned Behaviour.

1.7 Significance of the Study

1.7.1 Contribution to the Literature

Bringing together the area of principal leadership styles and psychological constructs such as the Teachers' Planned Behaviour and their subsequent outcome in terms of ICT usage in classroom instruction might provide valuable literature in this area of study. A study combining these areas could add to the literature on finding effective ways to improve ICT leadership and ICT integration in schools.

Most of the studies used the more traditional methods such as correlations and regressions to investigate the relationships between the constructs (Hair, Black, Babin, Anderson, & Tatham, 2006). Hair et al. (2006) stated that they all shared one common limitation: each of this technique could examine only a single relationship at a time. This study went a step further by examining the relationships among the four constructs simultaneously through the SEM technique. This study attempted to develop and validate a SEM model that would be able to explain the relationships between the constructs. The model would be useful in providing a clearer picture of the nature of relationships among the variables studied. This study hoped to derive new understanding and strategies which could contribute to the literature on the influence of Principal Leadership Styles on Teachers' Planned Behaviour in ICT Usage.

1.7.2 Implications for Practice

Results from this study also had implications for practical implementations among school principals. Findings related to the effects of Transformational and Transactional Leadership Styles on Teachers' Planned Behaviour in ICT usage in classroom instruction could help principals and the other school administrators to optimise their leadership capacity as school leaders. This study showed dimensions of Principal Transformational and Transactional Leadership that had impacts on Teachers' Planned Behaviour in classroom instruction and teachers' ICT usage. The findings could be employed to optimise teachers' computer use in classroom instruction.

This study formed a basis for discussions among educational leaders who were not informed by Malaysian empirical evidence. It would help to inform the education ministry in order to be more aware and sensitive to the Principal Leadership Styles in relation to teachers' ICT Usage in classroom in Malaysian schools.

This study might also help to inform teachers about their own perceived principal leadership styles that drive their behaviours about ICT usage. It has important implications for the input-process-output model, not only because Principal Leadership Styles are important school management indicators, but also because they are predictors of successful ICT usage in classroom instruction for teachers.

In the Malaysian context, teachers are required to use ICT in their classrooms; in particular, for subjects such as Mathematics, Science, and English. Teachers are provided with ICT equipment and should make extensive use of the ICT tools to create and maintain meaningful learning environments. However, empirical research relating to ICT in secondary education is still relatively little in Malaysia (Samuel & Zaitun Abu Bakar, 2006).

Furthermore, as most existing findings about ICT integration in education are from Western countries, educators from Malaysia have to depend on the results and recommendations from these researches. The results and recommendations from the western nations might not be applicable in the Malaysian context due to the differences in culture and values. This study would be able to provide empirical evidence from a local context. The findings would contribute to the growing knowledge on the principal leadership styles and in particular transformational and transactional leadership styles and their effects on teachers' ICT adoption in enhancing the teaching and learning of Mathematics and science in Malaysia.

1.8 Limitations of the Study

The verification of self-reports by interviewing or observing participants' classroom practices was not carried out in this study because this study involved respondents from all over Malaysia, and thus was not feasible to carry out interviews.

Also, this study could be generalised only for mathematics and science teachers, and among the Malaysian government secondary schools only. It also only focused on the Transformational and

Transactional Leadership Styles of the principals and their effects on the teachers' ICT Usage in teaching and learning. However, the redefinition of Transformational and Transactional Leadership Styles into two different principal leadership styles resulted in the drop of certain dimensions and variables. Thus the transformational and Transactional Leadership styles were not measured comprehensively in this research. The major limitation of this study is the instrument of the main study which did not measured according to the original Transformational and Transactional leadership Styles as defined by Bass and Avolio (1994).

1.9 Operational Definitions

The following operational definitions were used in this study:

Idealised Influence (attribute): Attributions of principal who talks about his/her most important values and beliefs, talks optimistically about the future of ICT usage, specifies the importance of having a strong sense of purpose and considers the moral and ethical consequences of decisions in terms of ICT usage in classroom teaching.

Individual Consideration: A dimension relates to the principal who instils pride in the teacher for being associated with him/her and discusses in specific terms that is responsible for achieving performance targets in terms of my ICT usage in classroom teaching.

Intellectual Stimulation: A dimension relates to the principal who re-examines critical assumptions to question whether they are appropriate in terms of ICT usage in classroom teaching.

Contingent Reward: Expectations from the principal who provides the teacher with assistance in exchange for teacher's efforts in the area of using ICT and makes clear what the teacher can expect to receive when performance goals are achieved in terms of ICT usage in classroom teaching.

Management-by-exception (active): A dimension relates to principal who concentrates his/her full attention on dealing with mistakes and complaints of the teachers in terms of ICT usage in classroom teaching.

Attitude toward Behaviour: A dimension that relates to what the teacher likes and/or enjoys teaching Mathematics and Science using ICT.

Subjective Norm: A dimension that relates to educational researchers and/or computers societies which influence my usage of ICT in teaching Mathematics and Science.



Perceived Behavioural Control: A factor that refers to what the principal, colleagues, curriculum department and head of department think about teachers' use of ICT in teaching.

Overall Satisfaction: A dimension that refers to the information from Schoolnet/Internet and computer courseware (provided by the Ministry of Education) which provides the teacher with up-to-date information, in time for the need of the teacher and provides information that seems to be just about exactly what the teacher needs in terms of teaching Mathematics or Science.

Perceived Usefulness: A dimension that refers to the use of ICT (computer courseware, Internet or Laptop computer provided by the Ministry of Education) in teaching Mathematics and Science which enables tasks to be accomplished faster, saves teacher's time in terms of teaching, saves teacher's money, make teacher's lessons more interesting, improve teacher's presentations of teaching materials and make teacher's lessons more diverse.

ICT Use Intention: A factor measuring the outcomes of using ICT (computer courseware, Internet or Laptop computer provided by the Ministry of Education) in the teaching Mathematics and Science that make lessons more interesting, improve presentations of teaching materials and make lessons more diverse.

1.10 Summary

This chapter introduced the background of this study, the statement of the problem, objective of the study, research questions, significance of the study, limitations of the study and the operational definitions of the key terms used in this study. It formed the basis for the understanding of this study in the following chapters. The next chapter discusses the related literature on the school ICT leadership, principal leadership, types of leadership, Transformational and Transactional Leadership Styles of the principals, and teachers' ICT usage in classroom instruction as well as discussing the theories related to this study.

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